

REMARKS

The specification has been amended, Claims 5-6, 11-12 and 23-24 have been canceled, Claims 1-2, 7-8 and 17-22 have been amended, and Claims 25-31 have been added. Claims 1-2, 7-8, 17-22 and 25-31 are present in the application. Reconsideration of the application, as amended, is respectfully requested.

Claims 5-6, 11-12 and 23-24 were withdrawn from consideration, on the ground that they are drawn to a non-elected invention. These claims have been canceled without prejudice.

The Office Action objected to the specification under 37 CFR §1.71, and rejected Claim 1 under the first paragraph of 35 USC §112, on the ground that the originally-filed specification fails to support the recitation in Claim 1 of "fibers disposed to provide a matrix". This portion of Claim 1 has been amended in a manner which should overcome the objection and rejection.

The Office Action objected to a misspelling of the word "known" on page 1 of the specification. The foregoing amendment to the specification corrects this spelling error.

The Office Action raised an objection under 35 USC §132 to a prior amendment on page 4 of the specification, on the ground that it introduces new matter into the disclosure. The foregoing amendments delete the phrase which was previously inserted by amendment on page 4, thereby avoiding any question of new matter.

The Office Action rejected Claims 2, 8, 18, 20 and 22 under the second paragraph 35 USC §112 as indefinite, on the ground that the limitations "the solid phase" and "the liquid phase" in Claim 2 lack a proper antecedent basis. The foregoing amendments to Claim 2 are intended to eliminate this problem.

The Office Action objected to the specification under 37 CFR § 1.75, asserting that the specification fails to provide clear support for certain claim terminology, in particular the use of the term "integral" in Claim 1. This ground of rejection is respectfully traversed. In this regard, the attention of the Examiner is respectfully directed

to lines 16-22 on page 7 of the specification, where the specification explains that, in the disclosed embodiment, the plate 11 (Figure 2) is fabricated of a composite fiber material (such as a highly thermally conductive graphite), which is disposed in a matrix such as an epoxy. The specification goes on to explain that fibers 13 from the plate 11 extend from the plate into the cavity, without the matrix attached. In other words, the fibers 13 have portions which are disposed within the cavity, and also have portions which are disposed within the matrix and are thus part of plate 11. Thus, the portions of the fibers within the cavity are integral with the portions of the same fibers which are within the plate 11. It is thus believed proper for Claim 1 to recite this "integral" relationship, and notice to that effect is respectfully requested.

Turning to the merits, the Office Action rejected independent Claim 1 under 35 USC §103 as obvious in view of a combination of teaching from Lebailly U.S. Patent No. 5,404,272 and Hamburgen U.S. Patent No. 4,966,226. This rejection is respectfully traversed, for the following reasons. The Lebailly and Hamburgen patents each disclose a heat pipe. A heat pipe is a type of device fundamentally different from the type of device to which the present invention relates. In order to clearly demonstrate this difference, Applicants are enclosing a page from the fifth edition of the "McGraw-Hill Dictionary of Scientific and Technical Terms", which sets forth a technical definition of a "heat pipe", as follows:

A heat-transfer device consisting of a sealed metal tube with an inner lining of wicklike capillary material and a small amount of fluid in a partial vacuum; heat is absorbed at one end by vaporization of the fluid and is released at the other end by condensation of the vapor.

As recognized by the foregoing definition, a heat pipe is a heat transfer device, in particular a device which is highly efficient at accepting heat at one end while discharging a substantially identical amount of heat at the opposite end. As also recognized by the definition, a heat pipe only has a small amount of phase change material in the interior

thereof, and thus the volume of the phase change material is far too small to absorb and store any significant amount of heat. However, because this phase change material is in a partial vacuum, it is highly efficient at transferring heat from one end of the heat pipe to the other end thereof. Considering the heat pipe in its entirety, the rate of heat flow into the heat pipe during normal operation is substantially the same as the rate of heat flow out of the heat pipe. As a result, the heat pipe is highly efficient at transferring heat from one location to another, but during normal operation does not absorb and store any heat at all, or in other words does not experience any net increase in heat over time. There is thus a significant functional difference between a heat pipe of this known type, and a heat sink which is designed to truly absorb a net amount of heat over time.

The Lebailly and Hamburgers patents each disclose nothing more than a conventional heat pipe. For example, Figure 4 of Lebailly shows flat elements 6 which are heat pipes that operate to transfer heat from a circuit board 10 to a frame 13. Similarly, Hamburgers discloses in Figure 2 a heat pipe 30 which transfers heat from a heat source (shown at the bottom of the figure) to some fins (shown at the top of the figure). The device 6 of Lebailly and the device 30 of Hamburgers are each highly efficient at transferring heat therethrough. Considered as a whole, each has equal amounts of heat flowing into and out of it during normal operation. However, neither experiences a net absorption of any significant amount of heat during normal operation. Stated differently, neither device operates as a heat sink which absorbs heat. The amount of phase change material in each of these device is so small that it is not capable of absorbing heat over time in any significant quantity.

In contrast, the present application is directed specifically to a heat sink which, considered as a whole, is operative to actually absorb heat over time during normal operation. In this regard, independent Claim 1 expressly recites an apparatus having a "heat sink which in its entirety can absorb heat over time" (emphasis added). Neither Lebailly nor Hamburgers disclose any device which even remotely meets this limitation. Nor would it be obvious to modify either Lebailly nor Hamburgers to have this capability, because there is no simple and self-evident way to introduce into these devices the

capability to absorb a substantial amount of heat. In addition, even if such a modification is made, it necessarily renders them inoperative for their intended purpose of efficient heat transfer. That is, if they are modified to absorb heat, then they will store it rather than efficiently transfer it, which is inconsistent with their intended purpose. The lack of a simple and self-evident modification is a reflection of the fact that the modification would not be obvious. Moreover, the fact that such a modification would render the Lebailly and Hamburgen devices inoperative is a separate and independent indication that such a modification would not be obvious. There is no combination of teachings from Lebailly and Hamburgen which would avoid this problem, because Lebailly and Hamburgen cannot together teach what they each fail to teach separately. For these reasons, it is respectfully submitted that Lebailly and Hamburgen do not, separately or in combination, anticipate or render obvious the distinctive subject matter which is expressly recited in Claim 1, including "a heat sink which in its entirety can absorb heat over time". Claim 1 is thus believed to be clearly patentable over the combined teachings of Lebailly and Hamburgen, and notice to that effect is respectfully requested.

New independent Claim 25 expressly recites "a heat sink which in its entirety is operable to effect over a period of time a net absorption of heat from externally thereof". Independent Claim 30 is a method claim which includes a similar limitation. Claims 25 and 30 read onto the elected species, but are considered to be generic claims. Independent Claims 25 and 30 are thus believed to patentably distinct from Lebailly and Hamburgen for substantially the same reasons discussed above with respect to Claim 1. In addition, Claims 25 and 30 each expressly recite that the phase change material changes from a solid phase to a liquid phase as it absorbs heat. In contrast, Lebailly and Hamburgen each deal with heat pipes in which a very small amount of phase change material alternates between liquid and vapor states. The heat pipes of Lebailly and Hamburgen would be rendered inoperative by a phase change material which changes between solid and liquid states, because the solid state of the material would prevent the material from cyclically moving back and forth between the ends of the heat pipe in the manner required for proper operation of the heat pipe. Consequently, this distinction is

believed to further distinguish Claims 25 and 30 from Lebailly and Hamburgen. Claims 25 and 30 are thus believed to be patentable, and notice to that effect is respectfully requested.

The Office Action also combined Lebailly and Hamburgen with Hermanns U.S. Patent No. 4,408,659, in order to reject some dependent claims. In this regard, Hermanns was relied on specifically for the teaching of an enclosed cavity containing a solid to liquid phase change material, such as a paraffin wax. The Office Action asserted that it would be obvious to use the solid-to-liquid phase change material of Hermanns in a heat pipe of the type disclosed in Lebailly and/or Hamburgen. This assertion is respectfully traversed. If the phase change material of Hermanns was introduced into either the Lebailly device or the Hamburgen device, the device would be rendered completely inoperative. In the liquid phase, the phase change material of Hermanns would not be capable of rapidly moving from one end of the heat pipe to the other end in the manner required to efficiently transfer heat through the heat pipe. Moreover, when the liquid phase change material reached the cooler end of the heat pipe and gave up its heat, it would change back to a solid and then stay at the cooler end of the heat pipe, thereby interrupting the continuous cycle of movement which is required of the phase change material for proper operation of a heat pipe.

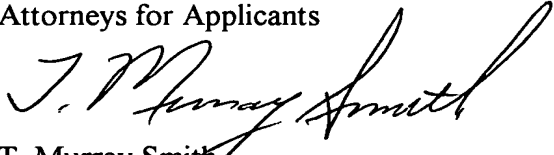
On top of these problems, it would be necessary to significantly increase the amount of phase change material within the heat pipes, in order for the phase change material to have sufficient volume to be able to absorb any meaningful amount of heat over time. However, this would further interfere with the necessary cyclic movement of the phase change material within the heat pipe, and thus also tend to render the heat pipe inoperative. For the foregoing reasons, it is respectfully submitted that it would not be obvious to incorporate the indicated teachings of Hermanns into the devices of Lebailly and/or Hamburgen, because it would unquestionably render them completely inoperative, and it is never an obvious expedite to modify a device so that it becomes inoperative. It is thus respectfully submitted that Claims 25 and 30 are patentably distinct from Lebailly and Hamburgen, even when considered in conjunction with Hermanns.

New dependent Claims 25-28 and 30-31 are believed to read onto the elected species. Claims 2, 7-8 and 17-21, Claims 26-29, and Claim 31 respectively depend from Claim 1, Claim 25 and Claim 30, and are also believed allowable over the art of record, for example for the same reasons discussed above with respect to Claims 1, 25 and 30, respectively.

Based on the foregoing, it is respectfully submitted that all of the pending claims are fully allowable, and favorable reconsideration of this application is therefore respectfully requested. If the Examiner believes that examination of the present application may be advanced in any way by a telephone conference, the Examiner is invited to contact the undersigned attorney at (214) 953-6684.

Although Applicants believe that no additional fees are due, the Commissioner is hereby authorized to charge any fees required by this paper, or to credit any overpayment, to Deposit Account No. 02-0384 of Baker & Botts, L.L.P.

Respectfully submitted,
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Fifth Edition of "McGraw-Hill
Dictionary of Scientific and
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